Investigation 3

Growth Factors and Growth Rates

In the previous investigation, you studied exponential growth of plants, mold, and a snake population. In each case, once you knew the growth factor and the starting value, you could make predictions. The growth factors in these examples were whole numbers. In this investigation, you will study examples of exponential growth with fractional growth factors.

3.1 Reproducing Rabbits

In 1859, a small number of rabbits were introduced to Australia by English settlers. The rabbits had no natural predators in Australia, so they reproduced rapidly and became a serious problem, eating grasses intended for sheep and cattle.

Did You Know?

In the mid-1990s, there were more than 300 million rabbits in Australia. The damage they caused cost Australian agriculture $600 million per year. There have been many attempts to curb Australia's rabbit population. In 1995, a deadly rabbit disease was deliberately spread, reducing the rabbit population by about half. However, because rabbits are developing immunity to the disease, the effects of this measure may not last.

Problem 3.1 Fractional Growth Factors

If biologists had counted the rabbits in Australia in the years after they were introduced, they might have collected data like these:

Growth of Rabbit Population

Time (yr)	Population
0	100
1	180
2	325
3	583
4	1,050

A. The table shows the rabbit population growing exponentially.

1. What is the growth factor? Explain how you found your answer.

2. Assume this growth pattern continued. Write an equation for the rabbit population p for any year n after the rabbits are first counted. Explain what the numbers in your equation represent.

3. How many rabbits will there be after 10 years? How many will there be after 25 years? After 50 years?

4. In how many years will the rabbit population exceed one million?

B. Suppose that, during a different time period, the rabbit population could be predicted by the equation $p = 15(1.2^n)$, where p is the population in millions, and n is the number of years.

1. What is the growth factor?

2. What was the initial population?

3. In how many years will the population double from the initial population?

4. What will the population be after 3 years? After how many more years will the population at 3 years double?

5. What will the population be after 10 years? After how many more years will the population at 10 years double?

6. How do the doubling times for parts (3)–(5) compare? Do you think the doubling time will be the same for this relationship no matter where you start to count?

ACE **Homework starts on page 38.**